WHAT IS CLAIMED IS:

1. A radiation detector comprising:

a scintillator configured to convert an incident X-ray into light;

a plurality of first photodiodes configured to convert the converted light into electrical signals;

a plurality of second photodiodes configured to convert the converted light into electrical signals; and

a plurality of switching elements connected to said first and second photodiodes;

wherein said n first photodiodes are continuously arrayed in a slice direction,

said m ($m < n$) second photodiodes are continuously arrayed on each of two sides of each array of said first photodiodes in the slice direction, and

said second photodiode has a sensitivity range width larger than that of said first photodiode in the slice.

2. A detector according to claim 1, wherein the number ($2 \cdot m$) of second photodiodes in the slice direction is larger than the number (n) of first photodiodes in the slice direction.

3. A detector according to claim 2, wherein the sensitivity range width of the second photodiode in the slice direction is substantially twice that of said first photodiode in the slice direction.

4. A detector according to claim 3, wherein the sensitivity range width of said second photodiode in the slice direction is substantially 1 mm, and the sensitivity range width of said first photodiode in the slice direction is substantially 0.5 mm.

5. A detector according to claim 4, wherein said 16 first photodiodes are arrayed in the slice direction, and said 12 second photodiodes are continuously arrayed on each of two sides of each array of said first photodiodes in the slice direction.

6. A detector according to claim 3, wherein the sensitivity range width of said second photodiode in a channel direction is substantially equal to that of said first photodiode.

7. A detector according to claim 6, wherein the sensitivity range width of said second photodiode in the channel direction is substantially equal to that of the second photodiode in the slice direction.

8. A radiation detecting system comprising:

a scintillator for converting an X-ray incident from a surface side into light;

at least one photodiode chip having a plurality of photodiodes for converting the converted light into electrical signals;

at least one switching chip having a plurality of switching elements for reading out a plurality of signals from said plurality of photodiodes;

at least one data acquisition chip having a plurality of data acquisition systems for amplifying the plurality of readout signals and converting the signals into digital signals; and

a rigid printed wiring board on which said photodiode chip, said switching chip, and said data acquisition chip are commonly mounted.

9. A detecting system according to claim 8, wherein

said photodiode chip is bump-connected to said rigid printed wiring board through a plurality of via interconnections which are connected to said plurality of photodiodes and extend through a semiconductor substrate from an upper surface to a lower surface,

said switching chip is connected to said rigid printed wiring board by flip chip bonding, and

said data acquisition chip is connected to said rigid printed wiring board by flip chip bonding.

10. A radiation detecting system comprising:

a scintillator for converting an X-ray incident from a surface side into light;

at least one photodiode chip having a plurality of photodiodes for converting the converted light into electrical signals;

at least one switching chip having a plurality of switching elements for reading out a plurality of signals from said plurality of photodiodes;

at least one data acquisition chip having a plurality of data acquisition systems for amplifying the plurality of readout signals and converting the signals into digital signals; and

a rigid multilayer wiring board on which said photodiode chip, said switching chip, and said data acquisition chip are commonly mounted.

11. A detecting system according to claim 10, wherein

said photodiode chip is bump-connected to an upper surface of said multilayer wiring board through a plurality of via interconnections which are connected to said plurality of photodiodes and extend through a semiconductor substrate from an upper surface to a lower surface,

said switching chip is connected to the upper surface of said rigid multilayer wiring board by flip chip bonding, and

said data acquisition chip is connected to a lower surface of said rigid multilayer wiring board by flip chip bonding.

12. A detecting system according to claim 10, wherein

said photodiode chip is bump-connected to an upper surface of said multilayer wiring board through a plurality of via interconnections which are connected to said plurality of photodiodes and extend through a

semiconductor substrate from an upper surface to a lower surface,

said switching chip is connected to a lower surface of said rigid multilayer wiring board by flip chip bonding, and

said data acquisition chip is connected to the lower surface of said rigid multilayer wiring board by flip chip bonding.

13. A detecting system according to claim 10, wherein a rear surface of said switching chip is bonded to the upper surface of said multilayer wiring board, a rear surface of said photodiode chip is bonded to an upper surface of said switching chip, and said data acquisition chip is bonded to the lower surface of said multilayer wiring board.

14. A detecting system according to claim 13, wherein

the plurality of photodiodes are connected to the plurality of switching elements through a plurality of first via interconnections extending through the photodiode substrate from an upper surface to a lower surface,

the plurality of switching elements are connected to a plurality of upper surface interconnections on said multilayer wiring board through a plurality of second via interconnections extending through a switching element board from an upper surface to a

lower surface, and

said data acquisition chip is connected a plurality of lower surface interconnections of said multilayer wiring board by flip chip bonding.

15. A detecting system according to claim 13, wherein said data acquisition chip is placed on a peripheral portion of said multilayer wiring board.

16. A detecting system according to claim 15, further comprising a plurality of X-ray shield plates placed above said data acquisition chip.

17. A radiation detecting system comprising:

a scintillator for converting an X-ray incident from a surface side into light;

at least one photodiode chip having a plurality of photodiodes for converting the converted light into electrical signals;

at least one switching chip having a plurality of switching elements for reading out a plurality of signals from said plurality of photodiodes;

at least one data acquisition chip having a plurality of data acquisition systems for amplifying the plurality of readout signals and converting the signals into digital signals;

a first rigid printed wiring board on which said photodiode chip and said switching chip are mounted;

a second rigid printed wiring board on which said data acquisition chip is mounted; and

a connector for detachably connecting said first rigid printed wiring board to said second rigid printed wiring board.

18. A system according to claim 17, wherein said photodiode chip is bump-connected to upper surface interconnections of said first rigid printed wiring board through a plurality of via interconnections which are connected to said plurality of photodiodes and extend through a semiconductor substrate from an upper surface to a lower surface.

19. An X-ray CT apparatus comprising:

an X-ray source which emits X-rays while rotating around an object to be examined;

a radiation detector having a plurality of detection elements for detecting X-rays passing through the object, which are arranged in row and column directions; and

reconstruction means for reconstructing a CT image of the object on the basis of an output from said radiation detector,

wherein said radiation detector includes

a scintillator for converting an incident X-ray into light,

a plurality of first photodiodes for converting the converted light into electrical signals,

a plurality of second photodiodes for converting the converted light into electrical signals, and

a plurality of switching elements connected to said first and second photodiodes,

said n first photodiodes being continuously arrayed in a slice direction,

said m ($m < n$) second photodiodes being continuously arrayed on each of two sides of each array of said first photodiodes in the slice direction, and

said second photodiode having a sensitivity range width larger than that of said first photodiode.

20. An X-ray CT apparatus comprising:

an X-ray source which emits X-rays while rotating around an object to be examined;

a radiation detection system having a plurality of detection elements for detecting X-rays passing through the object, which are arranged in row and column directions; and

reconstruction means for reconstructing a CT image of the object on the basis of the projection data,

wherein said radiation detection system includes

a scintillator for converting an X-ray incident from a surface side into light,

at least one photodiode chip having a plurality of photodiodes for converting the converted light into electrical signals,

at least one switching chip having a plurality of switching elements for reading out a plurality of signals from said plurality of photodiodes,

at least one data acquisition chip having a plurality of data acquisition systems for amplifying the plurality of readout signals and converting the signals into digital signals, and

a rigid printed wiring board on which said photodiode chip, said switching chip, and said data acquisition chip are commonly mounted.

21. An X-ray CT apparatus comprising:

an X-ray source which emits X-rays while rotating around an object to be examined;

a radiation detection system having a plurality of detection elements for detecting X-rays passing through the object, which are arranged in row and column directions; and

reconstruction means for reconstructing a CT image of the object on the basis of the projection data,

wherein said radiation detection system includes

a scintillator for converting an X-ray incident from a surface side into light,

at least one photodiode chip having a plurality of photodiodes for converting the converted light into electrical signals,

at least one switching chip having a plurality of switching elements for reading out a plurality of signals from said plurality of photodiodes,

at least one data acquisition chip having a plurality of data acquisition systems for amplifying

the plurality of readout signals and converting the signals into digital signals, and

a rigid multilayer printed wiring board on which said photodiode chip, said switching chip, and said data acquisition chip are commonly mounted.

22. An X-ray CT apparatus comprising:

an X-ray source which emits X-rays while rotating around an object to be examined;

a radiation detection system having a plurality of detection elements for detecting X-rays passing through the object, which are arranged in row and column directions; and

reconstruction means for reconstructing a CT image of the object on the basis of the projection data,

wherein said radiation detection system includes

a scintillator for converting an X-ray incident from a surface side into light,

at least one photodiode chip having a plurality of photodiodes for converting the converted light into electrical signals,

at least one switching chip having a plurality of switching elements for reading out a plurality of signals from said plurality of photodiodes,

at least one data acquisition chip having a plurality of data acquisition systems for amplifying the plurality of readout signals and converting the signals into digital signals,

a first rigid printed wiring board on which said photodiode chip and said switching chip are mounted;

a second rigid printed wiring board on which said data acquisition chip is mounted, and

a connector for detachably connecting said first rigid printed wiring board to said second rigid printed wiring board.

23. A radiation detection system comprising:

a detection element group constituted by a plurality of detection elements for detecting X-rays;

data acquisition means for acquiring output data from said detection element group;

a substrate on which at least one of said detection element group and said data acquisition means is mounted; and

means for forming said detection element group, said data acquisition means, and said substrate into a multilayer structure.

24. A radiation detection system comprising:

a scintillator block for converting X-rays into light;

a photodiode array for converting the light into electrical signals;

a switch for selecting a photodiode, from said photodiode array, from which an electrical signal is to be output;

a data acquisition chip for acquiring data output

from said photodiode array selected by said switch; and

means for integrating said scintillator block, said photodiode array, said switch, and said data acquisition chip.

25. An X-ray CT apparatus comprising:

an X-ray source which emits X-rays while rotating around an object to be examined;

a radiation detector having a plurality of detection elements for detecting X-rays passing through the object, which are arranged in row and column directions;

data acquisition means for acquiring projection data associated with the object by using an output from said radiation detector;

switch means for selecting data from the plurality of detection elements which are to be output to said data acquisition means;

reconstruction means for reconstructing a CT image of the object on the basis of the projection data; and

means for forming said radiation detector and at least one of said data acquisition means and said switch into a multilayer structure.

26. A radiation detection system comprising:

a detection element group constituted by a plurality of detection elements for detecting X-rays;

a first substrate on which said detection element group is mounted;

a data acquisition chip for acquiring output data from said detection element group;

a second substrate on which said data acquisition chip is mounted; and

connection means for connecting said first and second substrates in a one-to-one correspondence.

27. A system according to claim 26, wherein said connection means comprises a connector for electrically connecting said first and second substrates.

28. A system according to claim 27, wherein

said first substrate has said detection element group mounted on an X-ray incident surface side,

said second substrate has said data acquisition chip mounted on the other surface side with respect to the X-ray incident surface, and

said connection means connects through the connector a surface of said first substrate on which said detection element group is not mounted to a surface of said second substrate on which said data acquisition chip is not mounted.

29. A system according to claim 26, wherein said second substrate has said data acquisition chip mounted in an X-ray transmission area, and has the connector mounted outside the X-ray transmission area.

30. An X-ray CT apparatus comprising:

an X-ray source which emits X-rays while rotating around an object to be examined;

a radiation detector having a plurality of detection elements for detecting X-rays passing through the object, which are arranged in row and column directions;

data acquisition means for acquiring projection data associated with the object by using an output from said radiation detector;

reconstruction means for reconstructing a CT image of the object on the basis of the projection data; and

connection means for connecting in a one-one-one correspondence a first substrate on which said X-ray detector is mounted to a second substrate on which said data acquisition means is mounted.

31. A radiation detector comprising:

a first detection element array group constituted by a plurality of first detection element rows in a slice direction, each first detection element row having a plurality of first detection element arrays, each array having a first width in the slice direction; and

a second detection element array group constituted by a plurality of second detection element rows in the slice direction, each second detection element row having a plurality of second detection element arrays, each array having a second width larger than the first width in the slice, the second detection element rows being arranged in the slice direction at the both sides

of the first detection element rows, the second detection element rows of each side being fewer than the first detection element rows.

32. A detector according to claim 31, wherein the total number of the second detection element rows at both sides is larger than the number of the first detection element rows.

33. An X-ray CT apparatus comprising:

an X-ray source for generating X-rays;

a radiation detector;

data acquisition means for acquiring transmission data associated with an object to be examined by using an output from said radiation detector;

a reconstructing unit for reconstructing image data on the basis of the transmission data obtained from said data acquisition means; and

a display unit for displaying the reconstructed image data,

wherein said radiation detector comprises:

a first detection element array group constituted by a plurality of first detection element rows in a slice direction, each first detection element row having a plurality of first detection element arrays, each array having a first width in the slice direction; and

a second detection element array group constituted by a plurality of second detection element rows in the

slice direction, each second detection element row having a plurality of second detection element arrays, each array having a second width larger than the first width in the slice, the second detection element rows being arranged in the slice direction at the both sides of the first detection element rows, the second detection element rows of each side being fewer than the first detection element rows.

34. An apparatus according to claim 33, wherein said reconstructing unit reconstructs volume data made of isotropic voxel data.

35. An apparatus according to claim 34, wherein

said apparatus further comprises moving means for moving said X-ray source or the object to make said X-ray source lay down a helical trajactory around the object, and

said reconstructing unit reconstructs volume data made of the isotropic voxel data on the basis of an imaging condition including at least one of an imaging area, a detection element array used for the data acquisition, a helical pitch, a scanning range, a scanning time, and a tube current.